Nontraumatic Bilateral Bifid Condyle and Intermittent Joint Lock: A Case Report and Literature Review

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Bilateral bifid mandibular condyles (BMC) are a rare disorder, described as "the duplicity of the head of the mandibular condyle."[1] Shaber[2] reported the first case of bilateral BMC in a living person. BMC has been described in living persons or in skeletal specimens.

The etiology is still unknown, but evidence has suggested that it could be of traumatic or nontraumatic origin.[3-7] Even a postinfectious cause has been suggested.[8] No predilection for any particular race or gender has been reported for BMC.[9] The etiology of trauma cannot be evidenced in all traumatic cases, with possible trauma at young ages being suggested. Some investigators have suggested that the mediolateral condylar position is associated with a nontraumatic etiology, whereas the anteroposterior condylar position is associated with a traumatic origin.[10] Asymptomatic BMC is usually associated with a nontraumatic etiology, being detected by routine dental examination for other issues. There have been reported cases of symptomatic BMC in the literature, most of which have been associated with ankylosis[11] or a traumatic pathology. Symptomatic BMC is very rare in nontraumatic cases, being associated with disc displacement and rheumatoid arthritis. Pain is the most reported symptom, but there have been no reported cases of nontraumatic bilateral BMC with intermittent joint lock and pain. The purpose of this study was to *1*) report a new unique case of nontraumatic BMC with intermittent joint lock and no internal derangements of the temporomandibular joint (TMJ); *2*) discuss the etiology and symptoms of the intermittent joint lock; and *3*) review cases of BMC in the English-language literature. Informed consent was obtained before performing the study. The procedures and protocol were approved by the institutional review board and by the ethics committee of the university (number 173/26.10.2010).

Report of a Case

A 24-year-old man presented in October 2010 with a complaint of pain in the 2 TMJs. Pain intensity on a scale from 0 to 10 was subjectively determined by the patient as 2/10 in the right joint and 5/10 in the left joint. Clinical assessment was conducted using a standardized clinical examination procedure (Research Diagnostic Criteria for Temporomandibular Disorders[12]). This protocol included an evaluation of the patient's history, palpation of TMJs, auscultation of joint noises, and measurement of mandibular range of motion. The patient had a negative family history and denied any TMJ trauma. He reported the onset of intermittent joint lock at 13 years of age with decreased mouth opening and joint pain. The patient mentioned that his joints locked when he did not move the jaw for 4 to 6 hours (eg, during sleep). On awakening he felt his jaw locked; to open his mandible, he used muscle force by moving the mandible sideward (lateral movements) and joint massage. When opening his mouth after the night locking, he felt pain (4/10) in the 2 joints for a few minutes. On physical examination, the patient had a symmetrical face and proportional facial characteristics. The distance between the marginal ridges of the maxillary and mandibular incisors at attempted full mouth opening and lateral excursions were measured with a metal millimeter ruler. Noise in the TMJ and tenderness in the joint and masticator muscles were evaluated by palpation and auscultation. Maximum right lateral movement was 11 mm, maximum left

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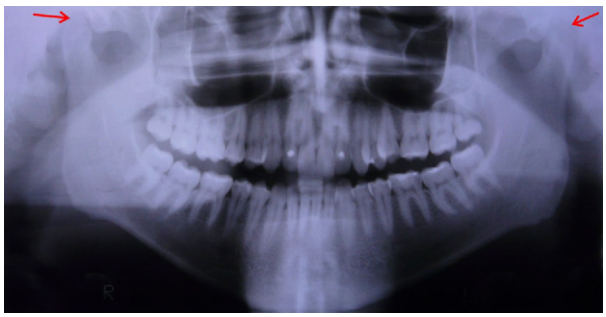

FIGURE 1. Panoramic radiograph shows a normal bilateral aspect of the condyles (*arrows*).

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lateral movement was 12 mm, maximum protrusion was 9 mm, and maximum non-guided mouth opening was 48 mm, measured from the marginal ridges of the upper and lower incisors (obtained with very great difficulty after awakening). There was joint clicking during opening and closing. The clicking persisted during maximum propulsion. During maximum left excursion of the mandible, there was a click in the right joint; during maximum right excursion of the mandible, there was a click in the left joint.

Research Diagnostic Criteria for Temporomandibular Disorders suggested a bilateral disc dislocation with reduction. Panoramic radiograph displayed a symmetrical and normal aspect of the 2 condyles without evident signs of duplication (Fig 1). Based on clinical findings, on the suspicion of a bilateral anterior displaced disc, magnetic resonance imaging (MRI) was indicated. MRI in the coronal plane showed a bilateral BMC with a mediolateral condylar head position (Fig 2). Sagittal and coronal MRI showed a normal disc position in the 2 TMJs (Fig 3). No internal inflammatory signs or calcified loose body were found in either TMJ. To better evaluate TMJ bone morphology, a 3-dimensional cone-beam computed tomographic (CBCT) scan was obtained. Axial CBCT scan confirmed the markedly deformed appearance of the condyles and significant asymmetry of the temporal fossae on the right and left sides and showed duplicity of the condylar head on the 2 sides without signs of degeneration or TMJ pathology (Fig 4). The condylar structure was bilaterally normal and no signs of degenerative lesions were identified on CBCT scan.

Based on the patient's history and clinical, radiographic, CBCT, and MRI examinations, the diagnosis of nontraumatic bilateral BMC with intermittent joint lock and pain was suggested. The patient was treated conservatively with an unbreakable abrasion-resistant occlusal splint 1.8 mm in diameter (bonding plate DURASOFT; Scheu Dental, Iserlohn, Germany) with minimum elevation of the vertical occlusion. The splint facilitated muscle release and mandibular movements (Fig 5). Follow-up of the patient at 3 weeks and 2 months after wearing the splint showed improvement in joint function and pain relief. The follow-up visit at 2 months showed decreased pain in the 2 joints (1/10 pain intensity in right joint and 2/10 in left joint at palpation during the day and 2/10 in the 2 joints at awakening). Joint function improved with a decreased frequency of clicking at awakening and was unlikely during the day.

Discussion

BMC is a rare condition and its etiology/pathology is not always conclusive. Therefore, reviewing the literature for traumatic and nontraumatic conditions of BMC was considered important. Another aim was to note the clinical symptoms in reported cases ac-

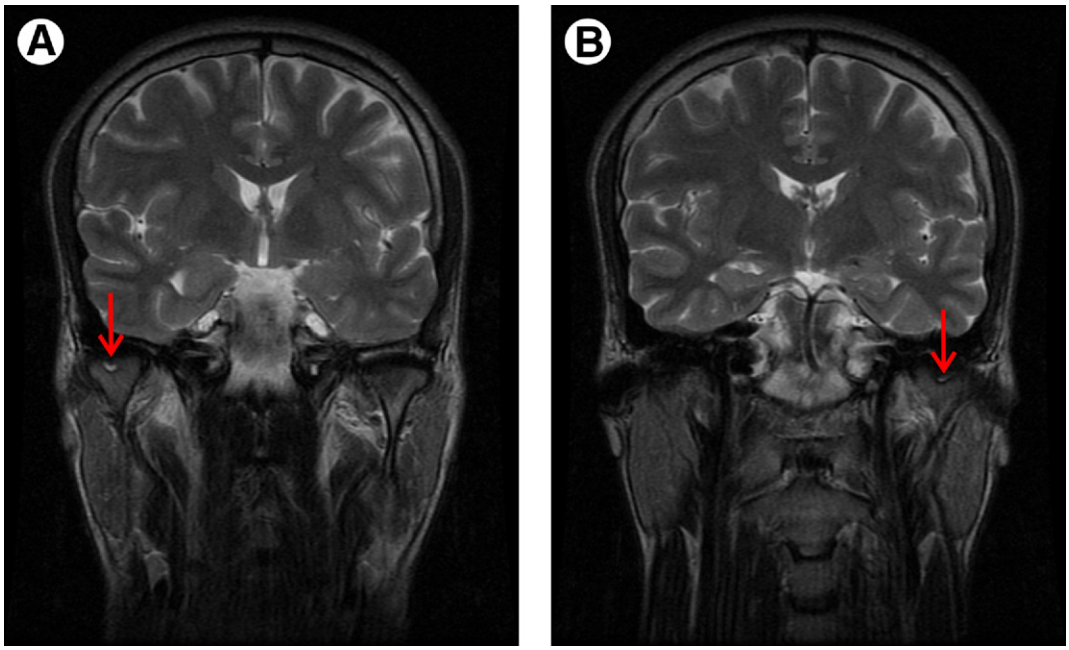

FIGURE 2. Coronal fast spin echo T1-weighted magnetic resonance images (repetition time, 1,720 ms; echo time, 22.7 ms; field of view, 12 cm) show the *A*, right and *B*, left bifid condylar head in the mediolateral position (*arrows*).

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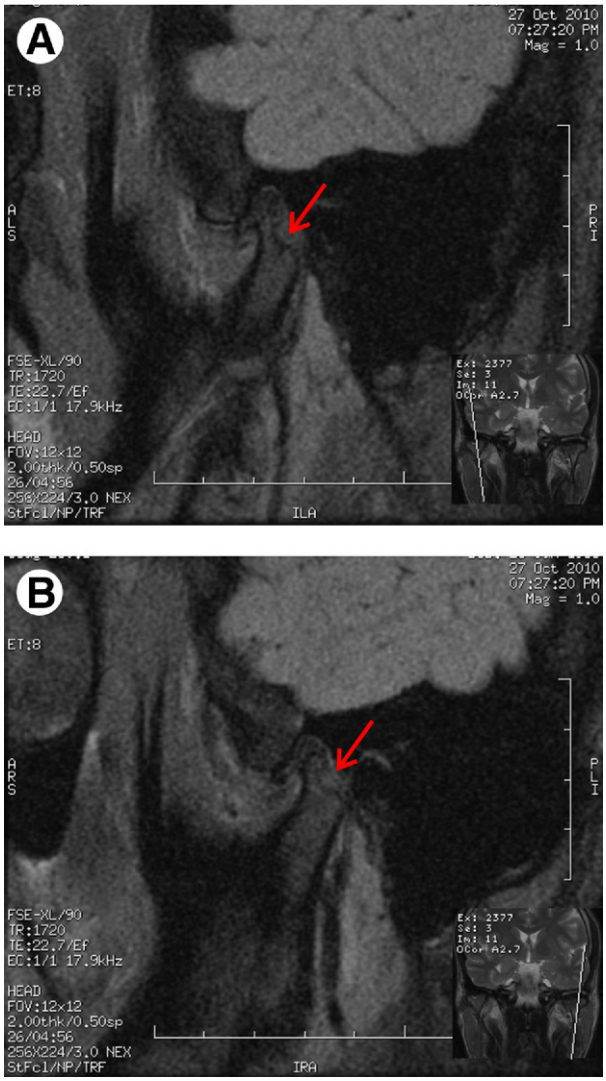

FIGURE 3. Sagittal magnetic resonance images of *A*, right and *B*, left temporomandibular joints in closed position suggest a bifid condyle and normal disc position (*arrows*).

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cording to etiology. A literature review of English language articles was performed using the PubMed database. The inclusion criterion for article selection was the presence of unilateral or bilateral BMC in living patients, with data concerning etiology, condyle position, radiologic examination, and clinical signs in articles published since 1985. One hundred three new cases of BMC were found, excluding previously reported cases in review articles. A unilateral/bilateral ratio of 2:1 for BMC was found (Table 1). Cases without a history of trauma were considered of nontraumatic origin. Sixty-six nontraumatic cases were found (64.07%). Panoramic radiography was the primary diagnostic tool reported.

Although panoramic radiography is a valid diagnostic tool in the diagnosis of bilateral BMC, conventional radiographs were not sufficient to reach a final diagnosis. Overlapping of some anatomic structures on panoramic radiographs can obscure details such as condylar form. Computed tomography was usually considered the test of choice for establishing the differential diagnosis.[13] The diagnosis of BMC was established by CT scan in 56 cases (54.36%). In addition to CT examination, a few cases were investigated using open-close linear tomography. MRI was indicated in only 4 nontraumatic cases for disc displacement assessment or for ear malformation diagnosis. The traumatic condition was best viewed by CT scan, and many investigators have recommended the performance of this examination in all cases with a traumatic history because of complications that might occur. In the absence of a traumatic history, the BMC was detected accidentally on conventional radiologic examination,[14] and an additional CT examination was indicated for a better view of the bone and joint surfaces. In the present case, MRI was recommended for the evaluation of disc position because disc displacement was clinically suspected. According to Wright,[15] for patients with temporomandibular disorders, MRI is used primarily to identify the disc position. In the present case, coronal and sagittal MRI displayed a bilateral BMC without any disc displacement or altered disc morphology. According to the etiologic/pathogenic origin, the orientation of the BMC was classified as anteroposterior and mediolateral. According to Blackwood,[16] 2 articulating surfaces of the BMC are divided by a groove and can be oriented mediolaterally or anteroposteriorly. The etiology of the BMC can be explained, according to Blackwood's theory, by well-vascularized fibrous septa that appear in the condylar cartilage at approximately 20 weeks of intrauterine life and extend to the cavity of the developing ascending ramus.[16] Szentpétery et al[10] suggested that when 2 condylar parts lie in the sagittal plane, the cause could be traumatic; when the condylar parts lie in the coronal plane, the cause could be persistence of the fibrous septa. Orientation of the mandibular head was used as a differentiating factor. The mediolateral orientation is presumed to result from a developmental cause; however, a sagittal split with anteroposterior orientation is associated with a previous, identifiable, traumatic event. The hypothesis of a developmental origin of mediolaterally oriented heads is also supported by Shriki et al.[17] The present review showed that the condylar position is most frequently mediolateral compared to the anteroposterior position in nontraumatic and traumatic cases (mediolateral, 82 cases; anteroposterior, 9 cases; Table 1).[17-40]

However, of nontraumatic cases, only 2 of 66 cases of BMC were anteroposterior; the other 64 were mediolateral. Of 35 traumatic cases, 7 were anteroposte-

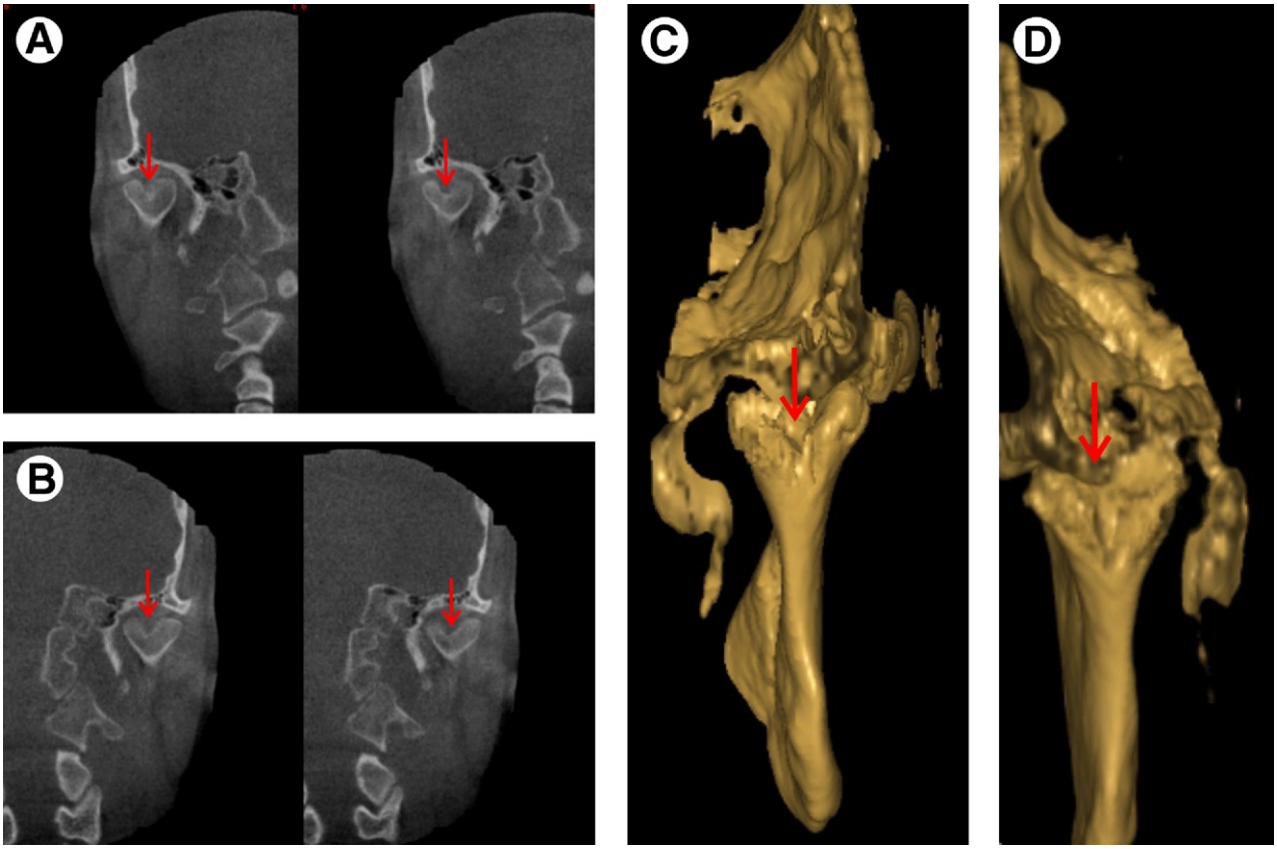

FIGURE 4. Cone-beam computed tomographic oblique coronal views of *A,* right and *B,* left temporomandibular joints with mediolateral condylar duplication (*arrows*). Three-dimensional posterior aspects of *C,* right and *D,* left temporomandibular joints (*arrows*).

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rior and 28 were mediolateral. Therefore, the anteroposterior condylar position is more frequent in traumatic BMC compared with nontraumatic cases. In the present case, CT scan suggested BMCs in the coronal plane with a mediolateral position, but the axial view showed an incomplete groove on the posterior head of the 2 condyles. Even the condylar position was mediolaterally oriented on CT scan; the panoramic radiograph did not depict this anomaly, possibly because of the incomplete division of the condylar head. Most reported cases with traumatic origin had a different degree of limitation in mandibular movement, whereas nontraumatic cases were mostly asymptomatic and detected by chance or by retrospective assessment of radiologic examination.[39] In nontraumatic cases, moderate pain with joint clicking has been reported.[30,33,40] Alpaslan et al[28] reported a nontraumatic case that had anterior disc displacement without reduction that could have explained the associated joint pain. Agarwal et al[33] presented a case of pain, rheumatoid arthritis, and BMC. Protrusive and lateral movements in 1 nontraumatic case were described by Antoniades et al.[1] Deceased mouth opening was reported in 1 case of nontraumatic BMC.[37] In the present case, mouth opening and lateral mandibular movements developed normal amplitude only after exercising some mandibular movements in the morning and after performing joint massage. On opening after the intermittent locking

FIGURE 5. Frontal view of centric occlusion with splint in place.

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Table 1. CASES OF BILATERAL BIFID CONDYLES REPORTED IN THE LITERATURE

Study	Cases	Etiology	Unilateral/ Bilateral Bifid Condyle	Bifid Condyle Position	Radiologic Examination	Clinical Signs
Zohar and Laurian,[18] 1987	1	Nontraumatic	NA	NA	NA	Supernumerary nipples, supernumerary sixth fingers, clinodactyly
Sahm and Witt,[19] 1989	1	Traumatic	Unilateral	Mediolateral	Panoramic radiography, CT	TMJ ankylosis
To,[20] 1989	1	Traumatic	Unilateral	Mediolateral	CT	Ankylosis
McCormick et al,[21] 1989	3	Nontraumatic	Bilateral	Mediolateral	Panoramic radiography	Asymptomatic
Phillips and Delzer,[22] 1992	1	NA	Unilateral	NA	NA	NA
Antoniades et al,[23] 1993	1	Traumatic	Unilateral	Anteroposterior	Panoramic radiography, CT	Deceased mouth opening
Kahl et al,[24] 1995	4	Traumatic	NA	NA	CT	Pain, decreased mouth opening
Cowan and Ferguson,[25] 1997	1	Nontraumatic	Unilateral	Mediolateral	Panoramic radiography, CT	Asymptomatic
Stefanou et al,[26] 1998	4	Nontraumatic	Bilateral	Mediolateral	Panoramic radiography, open-close TMJ linear tomography,	Asymptomatic
Artvinli and Kansu,[27] 2003	1	Traumatic	Bilateral	Mediolateral	Panoramic radiography, open-close linear tomography, CT	Asymptomatic
Alpaslan et al,[28] 2004	1	Nontraumatic	Bilateral	Anteroposterior	Panoramic radiography, open-close linear tomography, CT, MRI	Moderate pain, bilateral anterior disc displacement without reduction
Hersek et al,[29] 2004	1	Traumatic	Unilateral	Anteroposterior	Panoramic radiography, MRI, CT	Facial asymmetry, clicking, moderate pain, restricted protrusive and right lateral movement
de Sales et al,[6] 2004	1	Traumatic	Unilateral	Anteroposterior	Panoramic radiography, CT	Facial asymmetry, midline deviation, mandibular opening limited, pain
Antoniades et al,[1] 2004	1	Nontraumatic	Bilateral	Mediolateral	Panoramic radiography, CT	Snoring, mandibular hypoplasia, limited protrusive and lateral mandibular movement
Daniels and Ali,[3] 2005	1	Traumatic	Unilateral	Mediolateral	Panoramic radiography, CT	TMJ ankylosis, decreased hearing
Shriki et al,[17] 2005	2	Nontraumatic	Unilateral, bilateral	Mediolateral	CT, MRI	Ear malformation, headache
Corchero-Martín et al,[30] 2005	1	Nontraumatic	Unilateral	Anteroposterior	Panoramic radiography, CT, MRI	Pain, clicking
Tunçbilek et al,[31] 2006	1	Nontraumatic	Unilateral	NA	NA	Pain

Table 1. (Cont'd)

Study	Cases	Etiology	Unilateral/ Bilateral Bifid Condyle	Bifid Condyle Position	Radiologic Examination	Clinical Signs
Açikogöz,[32] 2006	1	Nontraumatic	Bilateral	Mediolateral	Panoramic radiography, CT	Asymptomatic
Agarwal et al,[33] 2006	2	Nontraumatic	NA	NA	NA	1 rheumatoid arthritis, 1 asymptomatic
Espinosa-Femenia et al,[34] 2006	1	Nontraumatic	Bilateral	Mediolateral	Panoramic radiography	Asymptomatic
Ramos et al,[35] 2006	1	Nontraumatic	Unilateral	Mediolateral	Panoramic radiography, MRI	Asymptomatic
Sales et al,[11] 2007	1	Traumatic	Unilateral	Mediolateral	CT	TMJ ankylosis
Menezes et al,[36] 2008	9	Nontraumatic	7 unilateral, 2 bilateral	Mediolateral	Panoramic radiography, CT	Asymptomatic
Plevnia et al,[4] 2009	1	Nontraumatic	NA	NA	NA	Asymptomatic
Rehman et al,[8] 2009	10	9 traumatic, 1 postinfectious	6 unilateral, 4 bilateral	2 anteroposterior, 8 mediolateral	CT	Restricted mouth opening, obstructive sleep apnea, chin deviation
Gulati et al,[37] 2009	2	1 nontraumatic	Unilateral	Mediolateral	CT	Decreased mouth opening, midline deviation
		1 traumatic	Unilateral	Anteroposterior	CT	Pain, TMJ ankylosis
López-López et al,[13] 2010	2	Nontraumatic	2 unilateral	NA	CT	Asymptomatic
Balaji,[38] 2010	12	Traumatic	3 bilateral, 9 unilateral	12 mediolateral	CT	Restricted mouth opening, chin deviation, TMJ ankylosis
Miloglu et al,[39] 2010	32	Nontraumatic	24 unilateral, 8 bilateral	Mediolateral	Panoramic radiography	Asymptomatic
Khonsari et al,[40] 2010	2	1 nontraumatic	Unilateral	Mediolateral	Panoramic radiography, CT	Pain
		1 traumatic	Unilateral	Anteroposterior	CT	Limited mouth opening

Abbreviations: CT, computed tomography; MRI, magnetic resonance imaging; NA, not available; TMJ, temporomandibular joint.

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episode, the patient had joint pain (4/10) for a few minutes. After the locking episode, the patient had a limitation of mouth opening and mandibular movement patterns. The most common and predominant symptoms of temporomandibular disorder are TMJ sounds,[1] which in the present case suggested possible disc displacement with reduction. After massage of the joint region, mandibular movements were restored to normal, in contrast to the suggestion by Rehman et al.[8] In the absence of disc displacement or internal joint derangement, clicking and limited mandibular movements could be explained by condylar morphology. Most cases of BMC are asymptomatic, but there can be associated symptoms such as clicking, moderate pain, and limitation of mandibular movements. The long-term functional effects of BMC could reflect an alteration of mandibular movements by intermittent lock. If suggested by the clinical condition, conservative treatment is indicated.

In conclusion, in nontraumatic BMC cases with intermittent joint lock, CT scan can be recommended to evaluate condylar morphology. In the present case, because of the difference in associated symptoms compared with the literature review, the diagnosis was established by MRI and confirmed by CT scan.

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